INDUSTRIALES RESEARCH MEETING 16

Rolling noise analysis for on-board road state evaluation

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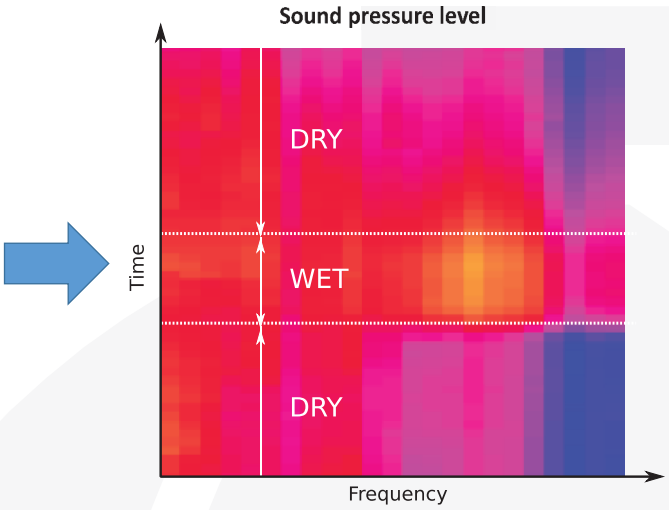
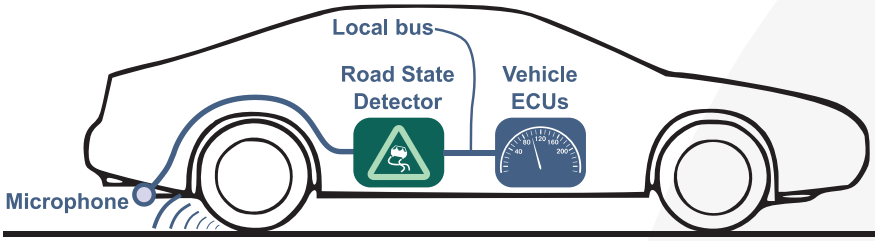
GRUPO DE INVESTIGACIÓN EN INSTRUMENTACIÓN Y ACÚSTICA APLICADA

Abstract

A system capable of analyzing the road state is proposed. This system captures and processes the noise produced by the interaction of the tires with the road, to reliably estimate the road surface conditions. Based on proposed system, an embedded device, tightly integrated with vehicle electronics has been designed and implemented. Resulting system, called Acoustic Asphalt Analyzer (A^3), is capable of working on-board and in real time, with a very high success rate and a very fast response time. It can be applied to surface auscultation or active safety in vehicles, being useful in initiatives such as connected and unmanned vehicles. A^3 allows to know the surface road conditions in real-time and provide data to the infrastructure manager, other drivers and the vehicle driver himself. The solution has been patented.





Principle of operation

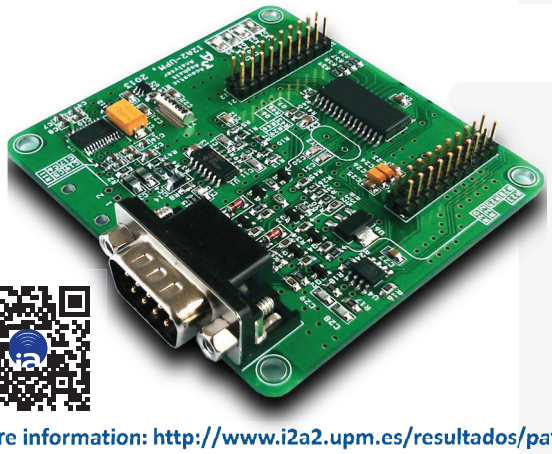
A^3 samples the tire/road noise generated during the displacement of motor vehicles. As the acoustic footprint obtained depends on the road status, it is possible to estimate the firm conditions by analyzing the obtained rolling noise samples.

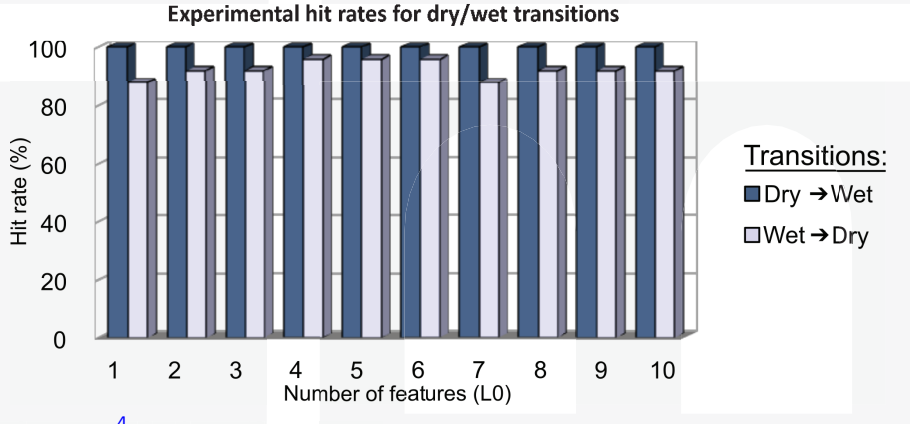
System intelligence

Obtained acoustic signals, along with support data directly read from the vehicle ECUs are grouped and pre-processed to generate a feature vector. This feature vector is processed by a previously trained Support Vector Machine based classifier, to obtain the road state estimation. Result is filtered to further enhance hit rate.

Technology solution

A^3 has been patented and is continuously evolving. At its current development stage, it can discriminate between dry and wet road surfaces with a very high success rate. It can also sort different types of surfaces according to their texture. It can be applied to surface auscultation, regarding infrastructure maintenance: roads and airports, and also in vehicles as an active safety element. The required electronic system is reliable, tightly integrated with vehicle electronics and cheap to produce: it is based on a general purpose microcontroller and an electret microphone.





More information: http://www.i2a2.upm.es/resultados/patentes-2/deteccion-del-estado-del-asfalto/